Example

$$m(t) = A \cdot \cos(2\pi f_1 t) + B \cos(2\pi f_2 t)$$

FM modulation:

index of FM modulation

$$\phi(t) = \beta \cdot \sin(2\pi f_m t)$$

$$\phi(t) = \beta_1 \sin(2\pi f_1 t) + \beta_2 \sin(2\pi f_2 t)$$

$$\beta = \frac{A_c \cdot f_d}{f_m}$$

$$\beta_1 = \frac{A \cdot f_d}{f_1}$$

$$\beta_2 = \frac{B \cdot f_d}{f_2}$$

FM modulated signal $x_d(t) = A_c \cos(2\pi f_c t + \phi(t))$

$$x_c(t) = A_c \cos\left(2\pi f_c t + \beta_1 \sin(2\pi f_1 t) + \beta_2 \sin(2\pi f_2 t)\right)$$

$$= \text{Re}\left[A_c \cdot e^{j2\pi f_c t} \cdot e^{j\beta_1 \sin(2\pi f_1 t)} \cdot e^{j\beta_2 \sin(2\pi f_2 t)} \right.$$

$$\sum_{n=-\infty}^{+\infty} J_n(\beta_1) e^{j2\pi n f_1 t} \qquad \sum_{n=-\infty}^{+\infty} J_n(\beta_2) \cdot e^{j2\pi n f_2 t}$$